

## REPORT

### Living in the Virtual Material World

Peter W. Holloway and Natalie Kononenko

University of Virginia

Material culture is one of the three main divisions of folklore. How people chose to dress, how they build their homes and how they decorate them is important to the people themselves and to their sense of identity. It is also important in the teaching of folklore. Letting students see what a culture looks like is invaluable in terms of conveying an accurate impression of that culture. In the classroom, material culture has the advantage of providing an additional stimulus, a visual one, so that students who are visual learners can better grasp abstract concepts such as variation. Quite often, those students who have a hard time understanding variation in a verbal text, such as a legend, understand variation when they are shown three different renditions of a traditional object, such as three variations of a ritual towel depicting a tree of life, as for example, in figure 1 below.



Figure 1

The traditional village house is an especially important item of material culture when it comes to areas such as Ukraine. A house is constructed human space. It is a microcosm of the Ukrainian view of the universe. Many important cultural ideas are contained within the house and can thus be illustrated by it. For example, in Ukrainian culture, differences such as those between inside and outside, our own and other, are very important. The house illustrates this in many ways. The door of the house does not face the street. Rather, one must come into the yard before one can go into the house; the house can only be entered from within the protective enclosure of the farm compound. *Rushnyky*, or ritual towels, embroidered pieces of cloth that are considered to have potency, protect all openings, be they concrete openings such as windows, or metaphoric openings such as icons and pictures, which are “windows” unto the other world. Icons are situated opposite the door, so that anyone entering a home, or even a room, must look upon them. This is believed to protect the residents of the home from evil. And inside/outside is but one of the many important culture ideas encapsulated in the traditional house.

The house is also important because of what it teaches about living conditions. Ukrainian village houses are quite small, especially for the number of people that live in them. For example, as many as twelve people at one time would stay in the two-room village house that we used for our work. Things like personal space and privacy are not operative cultural concepts. In addition to showing the very cramped living conditions of Ukraine, houses show the wealth of the countryside, or the lack of same. Or, one could argue, they demonstrate that what is valued is different from what we might consider important. Showing students a traditional house, therefore, is a very desirable aim. But, of course, arranging for the average student to travel to Ukraine to get the experience of the village house himself, while ideal, is impractical. With all this in mind and with the advent of ever more sophisticated digital technology, we set out to reproduce a traditional Ukrainian house in virtual form.

The house chosen was not entirely typical in that it was a double house, with two rooms constructed at the very beginning, rather than added on as children married and the family grew. Still, it was a hand-built house of wattle construction and, because all such houses in a village are traditional, it was representative. The main reason for choosing this house was access. With a certain wariness of strangers, Ukrainians are reluctant to admit people into their homes. Even if this cultural feature did not exist, the invasiveness of our work, as will be described below, required that we deal with a family that we knew well, one that would not mind us taking measurements and photographs all over their home. The techniques of digital construction are

presented below in an attempt to share our experience at digitally reproducing folklore with others.

Virtual Reality (VR) has become a popular way of displaying three-dimensional (3D) structures on the World Wide Web (WWW).(1) Very sophisticated sites have been built advertising museums(2) or cities.(3) Recent exhibitions at the National Gallery of Art have had extensive sites promoting them.(4) In contemplating the creation of a Virtual Ukrainian House, we were worried that the technique used by most of the above sites would not be applicable to our project. These sites used the simplest technique for generating a VR movie. This involves setting a (digital) camera upon a motorized turntable, which then rotates in steps, with a picture being taken each step. Approximately thirty pictures are taken and then joined into a 360-degree panoramic picture, which is then made into a QuickTime VR panorama movie with software. QuickTime VR is an extension of QuickTime technology produced by Apple Computers.(5) We were concerned that such a technique would not work in the confines of a space as small as the four meter-square room of a village house. Furthermore, such camera turntables are expensive and heavy. Weight is always a concern with fieldwork in places like Ukraine where transportation is frequently a problem and all the equipment has to be moved or carried, usually by the folklorist, to the site. Instead of using such a turntable, we opted instead to make a replica of the entire farm on the computer and then make the VR movie from the replica.

A VR panoramic movie is not a film that plays like a video. Rather, it produces a 3-D space in which the viewer can “move” using a cursor, panning left to right and right to left and zooming in and out. When a VR panoramic movie is opened on a computer with Apple QuickTime software (available free from Apple) the viewer sees a stationary scene with the mouse cursor displayed as a circle (⊙), as the mouse is moved with the left mouse button depressed, the circle changes to a solid arrow (→) with the arrow direction indicating the path of movement. The scene view then moves in that direction. There are also buttons at the bottom of the computer screen to zoom in or out. All this gives viewers the impression that they are in the actual scene and are looking around and moving. In addition, the scene can contain embedded “hot spots”. When the mouse cursor passes over one of these areas the cursor changes to an open arrow (↗) and, if the mouse button is clicked, the scene changes. The new scene can be a new panorama, a high-resolution enlargement of a portion of the original panorama, a standard movie sequence, a sound file, or a combination of these. Once in the new scene, the viewer can return, or proceed to another scene. Each of these individual scenes is assembled by computer software

(we chose VR Worx) and each scene is called a “node”. Our final Virtual Farm contained 45-nodes (see below).

We will describe in some detail the procedures used, including our mistakes, in the hope this may be of value to others. The house chosen is located in Iavorivka, Drabivs'kyi raion, Cherkas'ka oblast' and belongs to Polina Iakivna (Baba Polia) and Vasyli' Ivanovych Latysh (Did Vasyli'). The house was begun in 1951 by Baba Polia's parents, Iakov Hryhorovych Basans'kyi and his wife Odarka Dmytrivna, both born in 1894. The house was completed in 1953. The house is wattle construction and it was built by the Basans'kyi family using hand tools only. We suspected that no plans existed and we would have to “survey” the whole farm and house ourselves. This was, in fact, the case. The equipment we took from the United States was: a 2-mega pixel digital camera, a small tripod, memory cards, a small storage device for downloading the contents of the cards,(6) a Universal Serial Bus (USB) card for a computer, a USB memory card reader for a computer, an ultrasonic measuring device accurate up to 120 meters (Sonin),(7) a metric tape measure, a compass, and many batteries. As it turned out, electricity in the village house was much more reliable than we expected and a portable computer would have obviated much of the equipment. By the same token, we could have been unlucky and gotten no electricity and no pictures. In addition, with electricity we could run the equipment off (universal voltage) “cubes”. In Kyiv we bought flood light bulbs, holders, and wire to make a primitive lighting setup. This did not work. The digital camera could not handle the mixture of natural-light and tungsten-light.

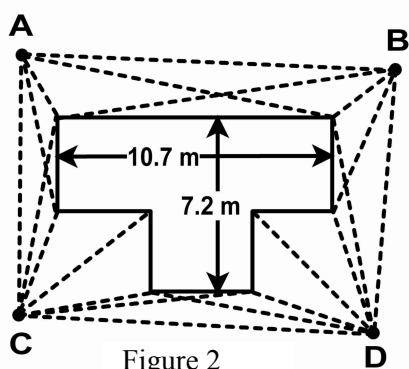


Figure 2

As shown in figure 2, the house is approximately 11 x 7 meters, and sits on a farm of approximately 60 x 60 meters. The dimensions of the house exterior were measured by driving four stakes (A-D) into the ground some distance from each corner. The distances between visible stakes and from each stake to each visible corner of the house were then measured with the Sonin instrument (these measurements are shown by dotted lines in figure 2). The length of each wall was also measured. The Sonin, which has both “emitter” and “receiver” units, was invaluable as the house is surrounded by bushes and trees. In brief, these measurements are combined to generate the footprint of the house by taking one stake (A) as a fixed point. All points visible from it are then somewhere on various arcs drawn with a

compass. The position of stake B is somewhere on an arc and its precise position can be defined by arcs drawn from other arcs. We had actually devised and checked this technique in the US, and all “defined” points are self-consistent with many measurements.

We then set out to measure the dimensions of “our” bedroom and furniture size and placement. Both the Sonin and the tape measure were used and yielded almost 100 distances. Digital photographs were taken from precise positions (as it turns out we never used the camera positions). Close-up photographs of the many family photographs and embroideries were taken. The process was repeated for each room of the house, but the number of our measurements became fewer as we could not “completely” disrupt the living arrangements of our adopted family. We also took fewer close-up photographs in the other rooms for the same reason. We regretted both of these economies as the quality of items used for creating the hot-spots in the main room and the kitchen is not as good as we would have liked. Also, we omitted measuring the thickness of the walls. From our external and internal measurements, they work out at 50 cm thick, which is reasonable for external walls given the construction methods. With all that we omitted, during the four days we were actually on the farm, we still took over 500 digital photographs of the interior and exterior of the house.

When we returned to Kyiv, we bought and installed a CD recording device in a friend's computer. We also installed the software we brought from the US to allow us to download the images from the storage device to the computer. We then made CDs to bring back to the US, but we asked our friend to keep all images on his computer until we had ensured that our copies had made it to the US. When we returned to the US, we sought advice on software purchases and finally settled on Strata 3D Plus,(8) a 3D graphics program, VR Worx,(9) a series of programs to make VR movies, and QuickTime Pro.

Strata is a very good program, but takes a long time to learn and generates enormous files. The program provides many “tools” for generating 3D objects (cubes, cones, spheres, tubes are pre-made). It also provides various “textures” which can be applied to the surfaces of the objects. Because of the popularity of the program, their web site contains many files that will generate furniture, vegetation, animals and so on, when downloaded (for free) and incorporated into a Strata scene. However, we did not want to use the generic furniture items; we were endeavoring to make an exact replica of the house and farm in Iavorivka. All the walls, furniture, kitchen utensils, even the well, had to be generated from simple shapes and covered with colors and textures that replicated those in the house in Ukraine. For readers who are unfamiliar with 3D

drawing, computer assisted design (CAD), or architectural programs, we will describe in some detail how a few of the items in our bedroom were made. The exterior wall starts with a cube. It is stretched to fit the dimensions we had measured for the wall in the house. A photograph of the actual white-washed wall is applied to the “bedroom wall”, and this generates a replica of the wall in Iavorivka. To make the objects on the wall, such as family photographs, another, much smaller, cube is made and then stretched very thin, until it corresponds to the dimensions of a family photograph plus frame. A digital photograph of the actual family picture is then applied to this object, and stretched to fit. The result is the “family photograph” in its computer rendition. It can now be moved around in Strata and positioned so as to be just in front of the “bedroom wall”, at the correct height and distance from other objects. Other digital photographs were similarly used to make the “hanging rugs” and “embroideries”.

A more complicated object is the brass bed shown in figure 3. Again, we were attempting to make an exact replica of the bed, including bed frame. A cube, with slightly

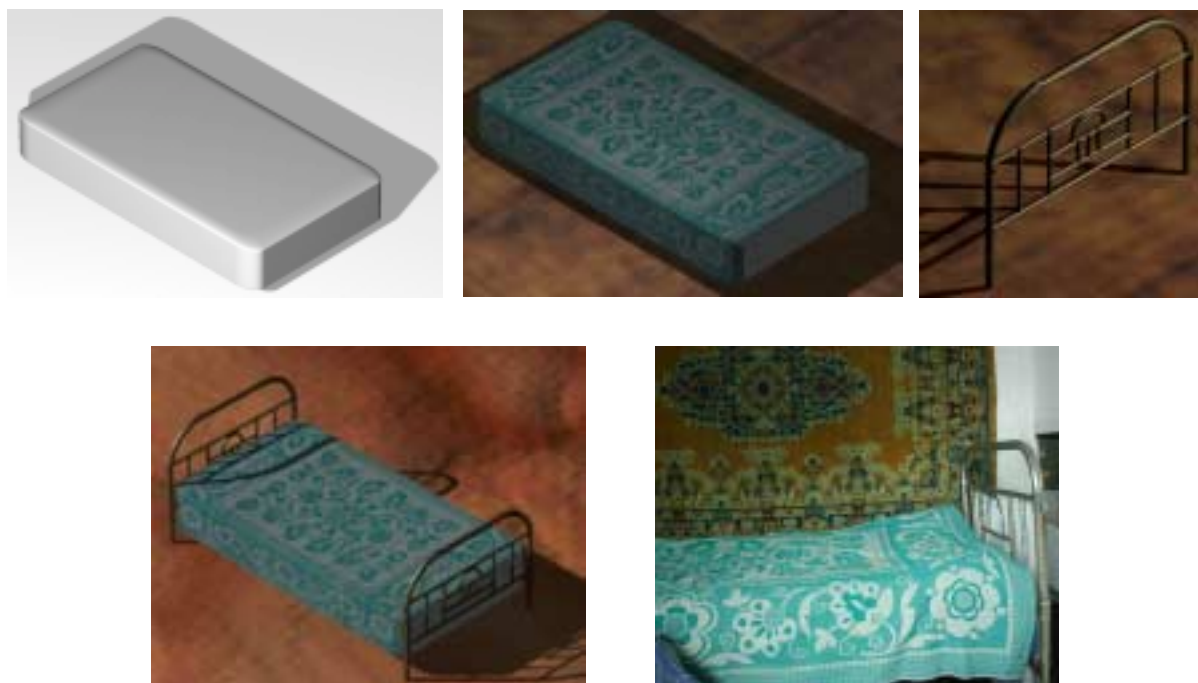


Figure 3

rounded edges, was made and elongated into the shape of the mattress. In the village, we had had the foresight to take a photograph of the bedspread hanging flat outside the house. This image of the entire bedspread as a flat surface provided us with the material for producing a virtual bedspread for our digital house. Portions of the flat bedspread photograph were “cut out” using a computer photo-editing program (each portion had to be “re-touched” to remove shadows).

These pieces corresponded to the top and side of the actual bed mattress as seen in our photographs of the bedroom. These separate pictures can be imported into Strata and applied to sides of 3D objects on the computer. When these pictures had been positioned and adjusted for size, this resulted in the “virtual mattress, covered with the bedspread” (second image in figure 3). The brass frame was made in the way an actual brass frame would be made and the shapes, dimensions, and designs were based on the actual bed in the house in Iavorivka, documented by taking measurements and photographs of the real bed. The various shapes were then drawn as lines (straight, curved) after which, Strata can “apply” a circular cross section, turning lines into tubes, like the tubes in the brass bed frame. This results in the formation of various “tubular” structures, which can be joined together and colored. The brass bed was actually the first complex object made, as a way of learning the program. From the time Strata was obtained, the generation of the complete brass bed took four weeks of intensive use. As just noted, much of this time was taken up in learning how to use the program. The steps to the brass bed are shown in figure 3. Note that lights, which cast shadows, are provided with the program. A photograph of the actual bed in the village bedroom is on the lower right of figure 3.

As we learned more and more about Strata, progress became more rapid. Figure 4 shows what we had achieved after six weeks of work, even though a great deal of time was wasted in trying to have both exterior and interior finishes to walls. The exterior views of our virtual farm we made later were constructed from a separate model.

The most complex model is shown in figure 5; with three rooms this became so unwieldy (250 megabytes, over 200 objects) that additional rooms were done separately.

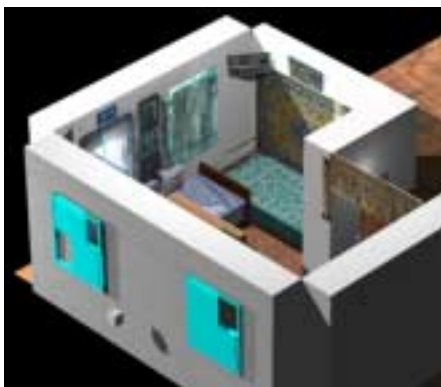


Figure 4



Figure 5



With Strata, “virtual cameras” can be placed in the “virtual rooms” and “virtual photographs” can then be taken. The program allows the positions (including height) and lens-zoom to be adjusted in the composition of the photograph. The layout of the bedroom is shown in figure 6, with the camera view angles indicated by the lines. When the “virtual photograph” is taken, it is seen on the computer and can be saved. The “photograph” taken by the “camera” in the left picture is seen on the right and shows the brass bed, family photographs, and hanging rug described earlier.

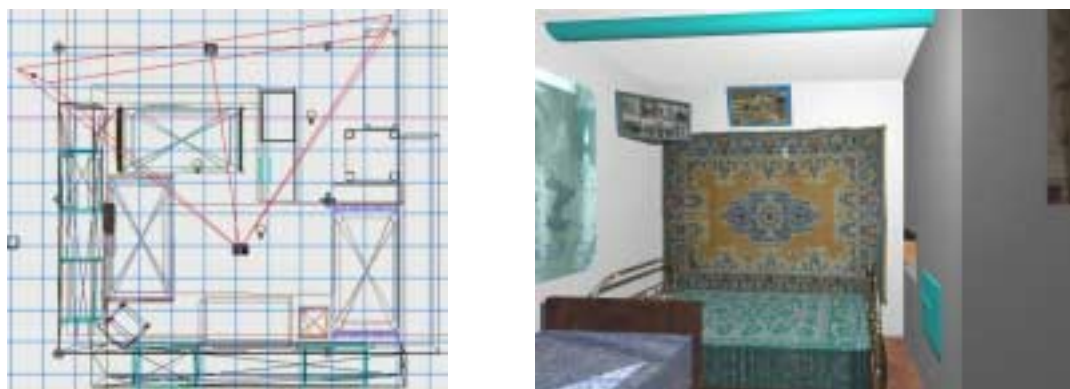


Figure 6

The same “camera” can also be used to generate a 360-degree panoramic picture (Figure 7), which is then converted into a QuickTime Virtual Reality panoramic movie with the program VR Worx.



Figure 7

Once all the individual panoramic movies are generated, they are combined with VR Worx. At this point the graphical interface of the program allows still pictures or sound files to be incorporated. The final 45-node scene for the entire Virtual Farm is shown in figure 8. Each circle is a “node” and the arrows show the allowed movements. When each “node” is viewed in the program, “hot spots” which link to other “nodes”, are inserted and can be moved on the scene. This allows, for example, a click of a mouse on an embroidery in the VR panorama to show an



enlarged view of the embroidery, whereas a click on a doorway allows the viewer to move into another room. These transitions are shown diagrammatically in figure 9.

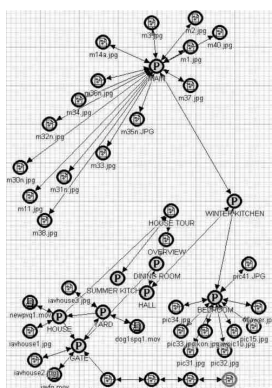


Figure 8



Figure 9

Sound files from tapes we made in Ukraine were assembled with still pictures into QTVR movies with QuickTime Pro and then incorporated into the QTVR panorama movie.

We have always been conscious of the limited resources of many of our Slavic and East European colleagues. Most do not have access to high-speed lines and their computers are not the latest models. With this in mind, we tried to keep the size of the files that have to be downloaded to a minimum. For example the un-compressed VR movie made from the above 45-node scene is 69 megabytes in size but, by judicious use of compression of different portions of the scene, quite reasonable VR movies of 2.4 megabytes can be made.

Most recently we have begun to make another type of VR movie that is particularly suited to displaying material culture. These are VR Object movies. This time, when these are opened in QuickTime, a stationary view of an object is seen with the cursor appearing as an “open hand”. When the mouse button is clicked, the hand “closes”. The object can now be rotated through 360-degrees, stopping at any point in the 360-degrees rotation to view the object from that side or angle. To make these VR Object movies, an object is placed on a turntable (Lazy Susan in the US) and rotated through 10-degree steps with a digital picture being taken at each step. After 36 photographs have been taken, VR Worx is used to assemble these into a QTVR Object movie which produces the rotatable stationary object. Below in figure 10 are shown eight of a 36-photo sequence of Natalie Kononenko (standing VERY still). A turntable capable of supporting a person can be made for less than \$20 and is ideal for showing Ukrainian native costumes. A 3-D presentation of a costume offers great advantages over the usual front



Figure 10

and back views of traditional clothing printed in books. The pleating of the jacket (*korsetka*) and the fullness that it adds to the body are much more apparent in the side, than in the front or back views. Thus, a 3-D rotatable presentation of traditional clothing gives a much more accurate idea of cultural body ideals.

A useful extension of this is to make QTVR Object movies of articles in the Virtual House that could not possibly be otherwise isolated, much less placed on a turntable. The stove (*pich*) in a village house has great symbolic significance, as well as dominating the entire house by its size. It is desirable to convey this to students. Yet, there is no way of showing a real stove as a discrete item. A stove is not only huge; it is built into the house walls as the house itself is constructed. Using digital technology, we have found a way of isolating the stove and presenting it as a separate, 3-D item that can be examined from all sides. The stove from the Virtual House in Strata can be isolated. Strata can place a “virtual track” around this object and will allow a “virtual camera” placed on the track to move along it, while pointed towards the object. By adjusting the “speed” at which the camera moves, a 36-frame movie can be generated. When this is viewed normally, one sees a rapidly spinning stove. This movie can now be disassembled into

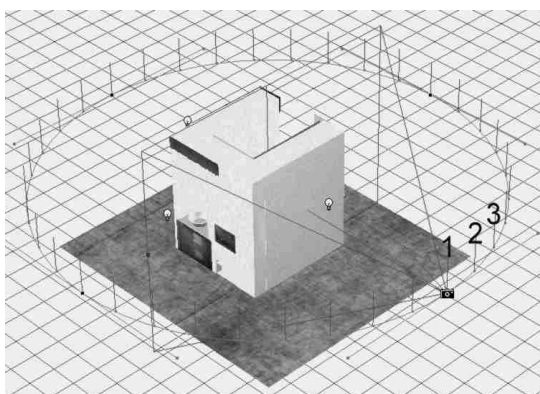


Figure 11

individual frames by QuickTime Pro and then re-assembled into an VR Object movie by VR Worx. The appearance of the scene in Strata, with the “camera” on the “track” around the stove is shown in figure 11 (the first three “camera” positions on the track have been numbered for clarity).

The generation of the whole Virtual Farm has been time-consuming, but much of this involved learning three new software programs. We feel that the effort was very much worthwhile and hope that our experiences might shorten the trial and error period for others. Our work, entitled Ukrainian Village Project, can be seen on the WWW at:

<http://cti.itc.virginia.edu/~nkm/>. The website, as it now stands, includes the complete Virtual Farm, the object movies described above, plus other materials such as a section on ritual towels or *rushnyky*. The website is ever-expanding, with additional descriptions of folklore and photographs added as time and resources permit. For example, we hope to include a section on contemporary Ukrainian performers, complete with sample sound files, within the next year.

At the moment we have no way of efficiently showing the videos that we have made, which are quite a few in number. We have extensive movies of two Ivan Kupalo festivals that we attended and photographed in 2001. There is a ritual “egg-ceremony” cure of our son performed by a traditional healer. We photographed walk-throughs of two village houses and our “home” village. Since the videos cannot currently be displayed on the WWW, we are willing to make them available to anyone interested in an alternative format. If you would like digital copies of our videos, please send us two blank CDs and a stamped self-addressed padded envelope and we will be happy to make copies and send them. We should add that our movies are un-rated by the Film Rating Board of the Classification and Rating Administration of the United States, but are suitable for small children and folklorists.

## NOTES

- 1 [http://www.multimedialibrary.com/QTVR\\_Section/qtvr\\_menu.html](http://www.multimedialibrary.com/QTVR_Section/qtvr_menu.html)
- 2 <http://www.exploratorium.edu/vr/index.html>
- 3 <http://www.virtuallyvancouver.com/index2.html>
- 4 <http://www.nga.gov/exhibitions/webtours.html>
- 5 <http://www.apple.com/quicktime/qtvr/>
- 6 <http://www.mindsatwork.net/>
- 7 <http://www.sonin.com/>
- 8 <http://www.strata.com/>
- 9 <http://www.vrtoolbox.com/>